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Steinbrecher

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(54) **SYSTEM AND METHOD FOR GENERATING WIRELESS ELECTROMAGNETIC TRANSMISSIONS MODULATED WITH SOFTWARE DEFINED COMPLEX WAVEFORMS**

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CPC ***H04B 1/0035*** (2013.01); ***H04B 1/0475*** (2013.01); ***H04B 7/0669*** (2013.01); ***H04L 27/04*** (2013.01); ***H04L 27/20*** (2013.01); *H04B 2001/0416* (2013.01)

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(56) **References Cited**

U.S. PATENT DOCUMENTS

9,182,485	B1 *	11/2015	Andrews	H01Q 3/30
2006/0097940	A1 *	5/2006	Shimawaki	H01Q 3/26 343/761
2016/0337017	A1 *	11/2016	Moon	H04B 7/0456

* cited by examiner

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(57) **ABSTRACT**

An air interface array system and method for generating electromagnetic transmissions is provided. The system includes partition elements separately and operationally connected to horizontal and vertical circuit boards. In transmission, a radio frequency input is provided to each board. Each circuit board has a phase selector that generates a symbol with one of four phases relative to a plane of the partition elements such an output signal is produced. A time delay selector delays the output signal in order to focus the transmitted beam to be an input signal to an amplifier. The amplified signal drives radio frequency ports to produce horizontally and vertically polarized radiated signal vectors. The signal vectors are combined to form a radio frequency modulation symbol vector. Multiple symbol vectors form a transmitted modulation waveform.

11 Claims, 10 Drawing Sheets